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PUBLICATIONS AND PATENTS

of the
NORTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
Peoria, Illinois, for the period
JANUARY - JUNE 1959

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Congress in 1938 authorized four regional laboratories to conduct basic and applied research designed to expand, improve, and develop through science and technology the utilization of American farm crops. Agricultural products assigned the Northern Division for study are: *The cereal grains*--corn, wheat, grain sorghum, and oats; *the oilseeds*--soybean, flaxseed, safflower, and erucic acid-containing oilseeds; and *new crops* screening. The abstracts in this list describe current research activities and indicate progress achieved by the Northern Division.

Northern Division publications are available, in conformance with United States Department of Agriculture policy, to scientists and other specialists, librarians, representatives of the press, and other individuals and organizations. Titles of publications no longer available are marked with an asterisk (*).

One copy each of 10 publications may be sent in response to specific requests. Please address: Publications, Northern Utilization Research and Development Division, 1815 North University, Peoria, Illinois.

Most of the publications are reprints of articles published in journals that are available in libraries. Any one who needs information may obtain it most efficiently by consulting a technical library. Photographic copies of most journal articles on research at this Division can be purchased from the Library of the U. S. Department of Agriculture, Washington 25, D. C.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with: Director, Library of the Department of Agriculture, Washington 25, D. C.

Printed copies of patents, which are assigned to the Secretary of Agriculture, can be obtained only by purchase (25 cents each) from the Commissioner of Patents, U. S. Patent Office, Washington 25, D. C. Order by number, do not send stamps.

Previous lists of publications and patents were issued as NM-305, AIC-187, and AIC-318, with supplements. Copies of these lists are available on request.

January - June 1959

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PUBLICATIONS

[Publications marked (*) are not available for distribution.]

MICROBIOLOGICAL ASSAYS WITH SEVERAL STRAINS OF *LEUCONOSTOC MESENTEROIDES*.

Margaret C. Shekleton and William C. Haynes.

J. Bacteriol. 77(1): 114-115. January 1959.

A comparative study of the suitability of seven strains of so-called *Leuconostoc mesenteroides* P-60 for assay of several amino acids was conducted. Two were unsatisfactory for use as assay organisms under our conditions. From the other five, NRRL B-1153 was selected as the most desirable microorganism for routine microbiological assays on the basis of its more nearly linear response to all the amino acids studied. The inadequacy of the designation "P-60 strain" and the need for specifying a substrain for use in microbiological assays are pointed out.

A NOTE ON EXPERIMENTAL WET-MILLING OF HIGH-AMYLOSE CORN.

R. A. Anderson and V. F. Pfeifer.

Cereal Chem. 36(1): 98-101. January 1959.

A series of preliminary wet-milling experiments were carried out on corn containing starch with an amylose content of about 50%. Considerable difficulty was experienced in separating starch from the gluten. By adjusting certain variables, it was possible to accomplish a fair separation. A large quantity of starch was prepared having a protein content of 0.72%. Processing studies on high-amylase corn will be continued as new samples are provided by corn breeders.

VINYL ETHER COPOLYMERS. NEW POTENTIAL COATINGS FROM SOYBEAN AND LINSEED OILS.

H. M. Teeter, L. E. Gast, and J. C. Cowan.

Paint Ind. Mag. 74(1): 13-14, 16-17. January 1959.

Vinyl ethers of unsaturated fatty alcohols derived from linseed and soybean oils polymerize, or copolymerize, with other vinyl ethers to give polymeric products having promise as protective coatings. Films show excellent adhesion to metals, including black iron and aluminum, and they have good resistance to water, alkali, and acid.

CEREALS RESEARCH AT THE NORTHERN REGIONAL RESEARCH LABORATORY.

F. R. Senti.

Cereal Sci. Today. 4(1): 6-10. January 1959.

The current program of research and product development on cereal grains is described. Chemical modification, fermentative conversion, genetic modification, improved processing methods, and fundamental and exploratory studies are the main areas covered. Dialdehyde starch, obtained by oxidation of hydroxyl groups to carbonyl groups, is one new product from grains. A water-soluble phosphomannan with high intrinsic viscosity was derived by using microorganisms to build a complex polymer from a carbohydrate substrate. High-amylose corn, exemplifying the third approach in developing new cereal products, is an outgrowth of 10 years' cooperation with corn breeders in perfecting new varieties useful industrially. Improvements have been made in drum-drying gluten, the artificial drying of corn, and wheat-conditioning. Examples are also included on the basic program to study the composition, structure, and chemical and physical properties of grains or their constituents.

AMINO ACID COMPOSITION OF SOYBEAN PROTEIN FRACTIONS.

C. H. VanEtten, J. E. Hubbard, Jean M. Mallan, A. K. Smith, and C. W. Blessin.
J. Agr. Food Chem. 7(2): 129-131. February 1959.

Soybean meal is of great economic importance because of its use in human foods and because it is a source of high-quality protein in formulating animal feeds. Amino acid analyses were made on soluble soybean protein and on acid-precipitated and heat-coagulated fractions. Mostly ion exchange chromatographic methods were used. The heat-coagulated fraction contained larger amounts of nearly all of the nutritionally essential amino acids than the total water-soluble protein. The amounts of amino acids in the water-soluble and acid-precipitated fractions were similar to reported values for the meal.

COMPARISON OF SOLUBILITY CHARACTERISTICS OF SELECTED SEED PROTEINS.

C. R. Smith, Jr., F. R. Earle, I. A. Wolff, and Quentin Jones.¹ (USDA Crops Res. Div., Beltsville, Md.)
J. Agr. Food Chem. 7(2): 133-136. February 1959.

Extractability of protein and other nitrogenous constituents of 41 species of seeds, representing 21 plant families, was studied. Considerable diversity in solubility characteristics was found, judging from the differing patterns of solubilities encountered in extraction with 0.01 M sodium hydroxide, 0.1 M disodium phosphate, 0.5 M sodium chloride, water, 70% ethanol, and 0.8 M trichloroacetic acid. These data provide information that will permit selection of species producing seed protein constituents which are extractable in high yield under mild conditions and that will allow an empirical grouping of similar plant materials as an aid in future studies.

POSSIBLE TOXIC FACTOR OF TRICHLOROETHYLENE-EXTRACTED SOYBEAN OIL MEAL.

L. L. McKinney, J. C. Picken, Jr.,¹ F. B. Weakley, A. C. Eldridge, R. E. Campbell, J. C. Cowan, and H. E. Biester.¹ (Veterinary Medical Research Institute, Iowa State College, Ames).
J. Am. Chem. Soc. 81(4): 909-915. February 20, 1959.

Treatment of amino acids and peptides with trichloroethylene, under conditions known to produce the bovine aplastic anemia-causing factor in soybean oil meal and other proteins, showed that trichloroethylene reacted readily with the sulphydryl groups of cysteine and reduced glutathione. The S-dichlorovinyl derivatives of L-cysteine and L-glutathione were synthesized and found to produce the aplastic anemia syndrome in calves typical of that produced by trichloroethylene-extracted soybean oil meal. The stability and properties of the S-dichlorovinyl derivatives are in agreement with known properties and mode of formation of the toxic principle in the meals. Enzymic hydrolysis of a toxic protein from trichloroethylene-extracted soybean oil meal resulted in the loss of a large portion of its toxicity. Chromatographic studies on the hydrolysate indicated the presence of products resembling the synthetic compounds, and giving tests for the S-dichlorovinyl group.

TOCOPHEROL OXIDATION IN FATS. HYDROGENATED SOYBEAN OIL.

C. D. Evans, E. N. Frankel, and Patricia M. Cooney.
J. Am. Oil Chemists' Soc. 36(2): 73-77. February 1959.

Destruction of tocopherol is markedly increased by residual hydrogenation catalyst. When fats are protected by citric acid, the initial loss of tocopherol is the least in the most unsaturated fat. The rate of tocopherol destruction after the induction period decreases with hydrogenation and shows a sharp break when a marked lowering of the linoleic acid occurs.

SOLUTION PROPERTIES OF DIALDEHYDE STARCH.

Samuel Levine, H. L. Griffin, and F. R. Senti.
J. Polymer Sci. 35: 31-42. February 1959.

Light-scattering, sedimentation, and viscosity measurements showed that the average particle weight in solutions of periodate oxidized starches generally decreased with increased level of oxidation and time of heating. Introduction of dialdehyde groups into the anhydroglucose residues of the starch molecules thus made the structure labile toward degradation on heating in water. An aggregation reaction also occurred in solutions of oxidized starches. This reaction was most evident at 10% oxidation level, but it was found to occur simultaneously with degradation over a range of oxidation levels.

Aggregation probably results from the reaction of aldehyde groups of one molecule with hydroxyl groups of neighboring molecules. The angular dependence of the light-scattering measurements indicated that formation of dumbbell shaped particles by cross-linking of near-spherical particles was probably quite important to the aggregation reaction.

REACTIONS OF UNSATURATED FATTY ALCOHOLS. IV. OXIDATIVE DEGRADATION OF LAURYL ISOPROPYL ETHER.

L. E. Gast, C. B. Coleman, and H. M. Teeter.
J. Org. Chem. 24: 160-165. February 1959.

Lauryl isopropyl ether containing catalytic amounts of cobalt naphthenate was degraded with oxygen at 150° C. Degradation products were separated by distillation, solvent extraction, and chromatography. Isolated oxidation products indicate attack at both carbon atoms adjacent to the ether oxygen. Degradation products isolated were lauric acid, acetone, isopropyl laurate, lower fatty acids from C₂ to C₁₁ and their esters, carbon dioxide, isopropyl alcohol, and polymerized acidic products. Lauric acid and isopropyl laurate were oxidized under the same conditions as lauryl isopropyl ether. Lauric acid gave small amounts of lower acids in the homologous series as degradation products. Isopropyl laurate was oxidized to fatty acids from C₂ to C₁₂ in about one-third the quantities found from lauryl isopropyl ether.

CARBOXYMETHYLATED SOYBEAN PROTEIN.

L. L. McKinney and E. H. Uhing.
J. Am. Oil Chemists' Soc. 36(2): 49-51. February 1959.

Soybean protein in aqueous alkaline dispersions at pH 10-11 reacts readily with sodium chloroacetate at temperatures of 50°-70° C. to give a protein derivative containing 7-9% carboxymethyl groups. When the reaction is carried out at 50° C. no change in the molecular size of the protein occurs, but at 70° C. the molecular weight is lowered. The reaction does lower minimum solubility from pH 4.5 to 3.1 and renders the protein more soluble at a neutral pH. Dispersions of carboxymethylated proteins exhibit resistance to putrefaction and do not gel on the addition of formaldehyde.

EVIDENCE FOR A NEW OXYGENATED FATTY ACID IN THE SEED OIL OF *CHRYSANTHEMUM CORONARIUM*.

C. R. Smith, Jr., Kay F. Koch, and I. A. Wolff.
Chem. and Ind. (London) (8): 259-260. February 1959.

A new epoxy fatty acid was detected in the seed oil of *Chrysanthemum coronarium* and was tentatively identified as 9,10-epoxy-12-octadecenoic acid. It is an isomer of the only other known naturally occurring epoxy fatty acid--vernolic acid.

GRAIN SORGHUM UTILIZATION RESEARCH.

W. D. Maclay.

Proceedings of the Grain Sorghum Research and Utilization Conference, sponsored by the Grain Sorghum Producers Association at Amarillo, Texas, March 3-4, 1959. pp. 13-20.

The wide range of investigations of grain sorghum since 1941, when the Northern Laboratory began operations, to the present, is reviewed. Production, price, and compositional relationships of sorghum are compared with other cereals. Past developments and future industrial applications leading to increased use of sorghum in milling, fermentative conversion, or chemical intermediates are described.

A NOTE ON METHODS OF DISPERSING FIFTY-PERCENT-AMYLOSE CORN STARCH.

J. W. Sloan, Majel M. MacMasters, and F. R. Senti.

Cereal Chem. 36(2): 196-198. March 1959.

Corn starch containing 50% amylose was dispersed in water with butanol at 150° C. and in water only at 10° higher temperature after pretreating the starch with a weak alkali solution. The starch was also solubilized with formamide to render it dispersible in water, and dispersions were evaluated by testing films made from them. Film properties were comparable to those of film made from a 1:1 mixture of amylose and amylopectin.

CYSTEINE THIOETHERS FROM CHLOROETHYLENES.

L. L. McKinney, A. C. Eldridge, and J. C. Cowan.

J. Am. Chem. Soc. 81(6): 1423-1427. March 20, 1959.

The S-vinyl derivatives formed by reacting cysteine with trichloroethylene, tetrachloroethylene, *cis*-dichloroethylene, and vinylidene chloride were prepared. Toxicity of these compounds to fungi, algae, seeds, and aquarium fish was investigated, and various degrees of toxicity were noted for two of the compounds.

MICROBIOLOGICAL PRODUCTION OF CAROTENOID. IV. EFFECT OF VARIOUS GRAINS ON PRODUCTION OF BETA-CAROTENE BY MATED STRAINS OF *BLAKESLEA TRISPORA*.

A. Ciegler, Margie Arnold, and R. F. Anderson.

Appl. Microbiol. 7(2): 94-98. March 1959.

The influence of various grains, alone and in various combinations, on the synthesis of β -carotene by paired cultures of + and - strains of *Blakeslea trispora* was investigated. The highest yields of carotene were obtained when hexane-extracted soybean oil meal was used as the chief nutrient. Between 35 and 40 mg. of carotene were obtained per 100 ml. of fermentation medium. Approximately 75 to 90% of the total carotene present was all-*trans*- β -carotene.

MICROBIOLOGICAL PRODUCTION OF CAROTENOID. V. EFFECT OF LIPIDS AND RELATED SUBSTANCES ON PRODUCTION OF BETA-CAROTENE.

A. Ciegler, Margie Arnold, and R. F. Anderson.

Appl. Microbiol. 7(2): 98-101. March 1959.

The synthesis of carotene by mated strains of *Blakeslea trispora* was considerably enhanced by the addition of various natural oils and greases to the medium. Oils containing primarily oleic and linoleic acids were particularly effective in stimulating β -carotene production. Synthesis of carotene was also favorably influenced by adding β - or α -ionone and certain nonionic surface-active agents.

PRODUCTION OF FUMARIC ACID BY *RHIZOPUS ARRHZIZUS*.

R. A. Rhodes, A. J. Moyer, Mabel L. Smith, and Sinah E. Kelley.
Appl. Microbiol. 7(2): 74-80. March 1959.

Optimal conditions were determined for the shaken-flask production of fumaric acid by two strains of *Rhizopus arrhzizus*. Fumaric acid was produced by the fermentation of 10 to 16% concentrations of glucose, sucrose, or high-test molasses. Under suitable conditions 60 to 70% of the sugar utilized was converted to fumaric acid in 3 to 8 days, depending upon the amount of sugar employed. Of the total acids produced, 75 to 80% was fumaric acid.

FRACTIONATION OF A CRUDE POLYSACCHARASE SYSTEM BY PREPARATIVE PAPER CHROMATOGRAPHY AND PAPER ELECTROPHORESIS.

M. J. Wolf, Veronica Jurkovich, and M. M. MacMasters.
Arch. Biochem. Biophys. 81(1): 15-24. March 1959.

Cellulase and pentosanase were largely separated from polygalacturonase in the crude preparation, Enzyme 19, by paper chromatography. A partial separation of pentosanase from other enzymes of the mixture was effected by paper electrophoresis. All of the enzymes studied except celiulase were inactivated by heating at 74-75° C.; almost 50% of the cellulase activity was retained. PG and PE were inactive above pH 7.0. Most of the enzymes studied appeared to have two or more components.

A CRITICAL STUDY OF SHORT-PERIOD CAUSTIC PULPING OF WHEAT STRAW.

A. J. Ernst, T. F. Clark, M. D. Finkner,¹ and H. J. Dutton. ¹ (Biometrical Services, USDA Plant Industry Station, Beltsville, Md.)
TAPPI. 42(3): 235-243. March 1959.

A statistically designed and replicated experiment to study 15-minute pulping of wheat straw was carried out at caustic concentrations of 4 to 10% (basis straw) and temperatures of 100° to 180° C. Data were acquired on tests of customary handsheets, as well as machine-made 9-point corrugating produced on a 10-inch laboratory Fourdrinier machine. The complex pulping data are presented in tabular form, in topographical presentations, and in statistical evaluations.

DETERMINATION OF COMPOSITION OF VINYL COPOLYMERS BY INFRARED.

Curtis A. Glass and Eugene H. Melvin.
J. Am. Oil Chemists' Soc. 36(3): 100-101. March 1959.

Copolymers of soybean vinyl ether with each of six, low alkyl, vinyl ethers were investigated in the infrared. The ether band in the 1100 cm.⁻¹ region was found useful in determining the composition of copolymers. The composition of copolymers was determined at a fixed frequency of 1100 cm.⁻¹ and at the absorption maximum in the region of 1100 cm.⁻¹. Determination may be accomplished with equal success at the absorption maximum in this region if the material being incorporated absorbs at a frequency not too far removed from 1100 cm.⁻¹. This would be the preferred method using a recording instrument.

LIST OF PUBLICATIONS AND PATENTS, Oilseeds and Related Subjects.
U. S. Dept. Agr. ARS-71-5, Supplement 4, March 1959. 5 pp.

THE GENUS ZYGORHYNCHUS.

C. W. Hesseltine, C. R. Benjamin, and B. S. Mehrotra.
Mycologia 51(2): 173-194. March-April 1959.

The genus *Zygorhynchus* Vuillemin, which has had 17 species and varieties described in it, was studied. It is concluded that there are six species and one variety including one new species, *Z. californiensis*, and a new variety, *Z. exponens* var. *smithii*. In addition *Z. exponens* Burgeff, *Z. moelleri* Vuill., *Z. macrocarpus* Ling-Young, *Z. heterogamus* (Vuill.) Vuill. and *Z. japonicus* Kominami are recognized. *Z. vuilleminii* Namysl. was reduced to synonymy under *Z. moelleri*, and *Z. hennebergii* Naumov is considered as a doubtful species.

STRUCTURE OF PIPERIDINO-HEXOSE-REDUCTONE.

F. Weygand,¹ H. Simon,¹ and W. Bitterlich¹ (University of Berlin) and J. E. Hodge and B. E. Fisher.

Tetrahedron. 6(2): 123-138. April 1959.

The structure of piperidino-hexose-reductone, first described by Hodge and coworkers, was clarified by degradation reactions. Dihydro-anhydro-piperidino-hexose-reductone, obtained from piperidino-hexose-reductone in a clear way, was synthesized by reacting 1-methyl-4-chlorocyclopenten(1)-ol(2)-one(3) with piperidine.

EFFECT OF STRUCTURE AND CRYSTALLINITY ON WATER SORPTION OF DEXTRANS.

N. W. Taylor, H. F. Zobel, N. N. Hellman, and F. R. Senti.
J. Phys. Chem. 63(4): 599-603. April 1959.

Water absorption and desorption isotherms were determined for 17 dextrans differing in their contents of 1,6-like, 1,4-like and 1,3-like linked units, but all initially amorphous as demonstrated by X-ray diffraction patterns. The absorption isotherms were identical up to 85% relative humidity, thus demonstrating no specific sorption effect assignable to the known structural elements. Above 85% relative humidity, water absorption varied with dextran type. X-ray diffraction experiments showed that high water absorption above 85% humidity corresponded to a continued amorphous state, while depressed water absorptions corresponded to crystallization of the dextrans. Generally, the presumably less branched dextrans with high proportions of 1,6-like linked units crystallized at high humidity. All amorphous dextrans which did not crystallize at high humidity were nearly identical both in absorption and desorption isotherms; above 75% humidity no water sorption hysteresis was observed.

AN ELECTROLYTIC PROCESS FOR MAKING SODIUM METAPERIODATE.

C. L. Mehlretter and C. S. Wise.
Ind. Eng. Chem. 51(4): 511-514. April 1959.

A practical procedure was devised for preparing aqueous periodic acid solutions by electrolysis. The process consists of oxidation of iodine in alkaline solution to sodium iodate in a divided cell followed by electrolysis under acidic conditions to produce periodic acid. A phase equilibrium study of the separation of sodium metaperiodate from sodium sulfate has developed optimum conditions for recovering crystalline sodium metaperiodate from neutralized periodic acid electrolysis liquors.

AMINO ACID COMPOSITION AND TOTAL PROTEIN CONTENT OF VARIOUS PLANT SEEDS.

C. R. Smith, Jr., M. C. Shekleton, I. A. Wolff, and Quentin Jones,¹ ¹ (USDA Crops Res. Div., Beltsville, Md.)
Econ. Botany. 13(2): 132-150. April-June 1959.

An extensive literature survey on seed proteins was made with attention given to both amino acid composition of various seed proteins and the total quantity of protein produced by the seeds. These data were grouped according to botanical classifications and correlations drawn where possible. The various plant families examined were rated according to their potentialities as protein-producing seed crops in the United States. As a beginning towards filling in some obvious gaps in amino acid composition data, amino acid assays were carried out for the first time on nine species of seeds.

ISOLATION OF VERNOLIC ACID FROM VERNONIA ANTHELMINTICA OIL.

C. R. Smith, Jr., Kay F. Koch, and I. A. Wolff.
J. Am. Oil Chemists' Soc. 36(5): 219-220. May 1959.

Vernolic acid, the epoxy fatty acid occurring in the oil of *Vernonia anthelmintica*, was isolated in a free state. This acid has not been previously reported in the literature, although the structure of the acid has been established by degradation of the corresponding dihydroxy acid obtained from the oil.

TYPE REACTIONS IN FERMENTATION CHEMISTRY.

L. L. Wallen, F. H. Stodola, and R. W. Jackson.
ARS-71-13, May 1959. 496 pp.

A compilation of over 1300 discrete chemical transformations carried out with micro-organisms has been prepared. Included are indices to reaction types, microorganisms, and authors, thereby providing ready location of desired data. The introductory section contains literature references, a brief discussion of fermentation equipment and procedures, and an historical account of the development and recognition of microbiological type reactions as a new research tool. Each entry in the type reactions section includes references to the original published article and its abstract; the names and structures of both substrate and product; the microorganisms employed; and the yield of product, when given.

TERMINAL OXIDASE OF ORCHARD GRASS.

H. L. Tookey.
Science. 129(3361): 1490. May 29, 1959.

As part of a study on nutrient losses during the curing of hay, the respiratory enzymes in green grass were examined. Orchard grass (var. *Potomac*) contains cytochrome oxidase and polyphenol oxidase, but no measurable ascorbic acid oxidase.

Several enzyme inhibitors, HCN, 1-phenyl-2-thiourea, and sodium diethyldithiocarbamate, were studied both *in vitro* and in surviving green leaves. The response of surviving leaves to inhibitors is consistent with a functional role for cytochrome oxidase in respiration. Polyphenol oxidase cannot be the terminal oxidase in this tissue.

RELATION OF THE RIGIDITY OF FLOUR, STARCH, AND GLUTEN GELS TO BREAD STALING.
J. E. Cluskey, N. W. Taylor, and F. R. Senti.
Cereal Chem. 36(3): 236-246. May 1959.

A penetrometer was modified to obtain load-depression curves on gels of wheat flour, starch, and gluten from which values of rigidity (Young's modulus) were calculated. Rigidity of flour and starch gels increased with time; this increase was most rapid within 1 to 2 days after preparation. Relatively less firming occurred for gluten in the same time. Reheating the flour and starch gels restored their original elasticity, whereas gluten gels were not affected by reheating. Results indicate that firming of bread crumb during staling can be attributed mainly to the starch fraction.

LABELLING FATTY ACIDS BY EXPOSURE TO TRITIUM GAS. I. SATURATED METHYL ESTERS.

R. F. Nystrom¹ (Radiocarbon Laboratory, University of Illinois, Urbana), L. H. Mason, E. P. Jones, and H. J. Dutton.
J. Am. Oil Chemists' Soc. 36(5): 212-214. May 1959.

Saturated fatty acids may be simply labeled with tritium in high specific activity by the Wilzbach procedure of gas exposure, and standard procedures of purification are effective in removing irradiation decomposition products and exchangeable tritium.

IONIZATION CHAMBER FOR HIGH-TEMPERATURE GAS CHROMATOGRAPHY.

L. H. Mason, H. J. Dutton, and L. R. Bair.
J. Chromatog. 2(3): 322-323. May 1959.

A description is given of a rugged, sensitive, ionization chamber constructed from readily available materials and applicable to high temperature (240° C.) gas chromatography.

A SIMPLE PILOT-PLANT ELECTROLYTIC CELL FOR PRODUCING DIALDEHYDE STARCH.
H. F. Conway and V. E. Sohns.
Ind. Eng. Chem. 51(5): 637-638. May 1959.

A simple pilot-plant electrolytic cell, patterned after a laboratory model was designed, fabricated, and operated to produce dialdehyde starch by electrolytic periodate oxidation of starch. Construction of the unit is simple; assembly, cleaning, and replacement of parts are accomplished easily. Operations and production of material with satisfactory quality have been routine with this cell, but some modifications in design are required for a unit to be utilized in large-scale production.

A STUDY OF THE EFFECT OF DRYING CONDITIONS ON THE SUITABILITY FOR STARCH PRODUCTION OF CORN ARTIFICIALLY DRIED AFTER SHELLING.

Majel M. MacMasters, M. D. Finkner,¹ (Biometrical Services, USDA Plant Industry Station, Beltsville, Md.) Margaret M. Holzapfel, J. H. Ramser,² and G. H. Dungan² (Illinois Agricultural Experiment Station, Urbana).
Cereal Chem. 36(3): 247-260. May 1959.

Corn from 5 crop years (1952-1956) was grown, harvested at approximately 30% and 20% moisture content, and dried at 6 air temperatures ranging between 120° F. (48.9° C.) and 200° F. (93.3° C.), each with air at 15% R.H. and 40% R.H., respectively. Drying conditions were such that the corn doubtless reached the temperature of the drying air. Controls were dried in ambient air.

On the basis of recovery and quality of the starch, acceptable processing of corn was obtained in the laboratory when the grain had reached a temperature as high as 160° F. (71.1° C.) during drying, regardless of the initial moisture content of the corn and the prevailing conditions of relative humidity. Corn oil is an important byproduct of commercial processing. Corn with dead germ is difficult to process, and the subsequent yield and quality of the oil are low. Hence, the 2,3,5-triphenyl-tetrazolium chloride color test for viability was used to determine the state of the germ. Corn that had reached temperatures above 140° F. (60° C.) during drying showed a definite decrease in viability and was considered to be lowered in quality for use in starch production.

HYDROXYETHYLATED CEREAL FLOURS.

J. C. Rankin, C. L. Mehlretter, and F. R. Senti.

Cereal Chem. 36(3): 215-227. May 1959.

Flour in a dry mixture with alkali catalyst was readily hydroxyethylated with ethylene oxide. Cooked pastes of etherified flours were fluid in character, did not retrograde on cooling and aging, and had a pattern of viscosity behavior in the cooking-cooling cycle comparable to similarly substituted starches. Their clarity was not equal to hydroxyethyl starch pastes; however, reacting flour or starch with ethylene oxide significantly improved paste clarity of either starting material. Surface tension measurements showed that the modified flour pastes had unusual surface activity.

Quantitative yields of hydroxyethylated flours obtained by this relatively simple procedure, together with improved viscosity properties of cooked pastes over those of unreacted flour, indicate promise for these cereal products in industrial applications.

FATTY ACIDS OF SORGHUM LEAF AND STEM.

M. C. Burnett and R. L. Lohmar.

J. Agr. Food Chem. 7(6): 436-437. June 1959.

Lipides of sorghum leaf and stem were solvent-partitioned into three distinct fractions representing 37, 40, and 23% of the lipide extract. Fatty acid composition of each fraction was determined by gas chromatography. The major unsaturated acid was linolenic and the major portion of this was present in the 80% ethanol fraction, less being found in the hexane and heptane fractions. The major saturated acid was palmitic, which was relatively evenly distributed among the fractions. The fatty acid composition of sorghum leaf and stem differs markedly from that of sorghum grain, but resembles that of other grasses and nonseed plant lipides.

FLASH DESOLVENTIZER OPERATION TO PRODUCE SOYBEAN PROTEIN FLAKES.

O. L. Brekke, G. C. Mustakas, M. C. Raether, and E. L. Griffin.

J. Am. Oil Chemists' Soc. 36(6): 256-260. June 1959.

In the process the solvent (hexane) is quickly vaporized in a stream of superheated vapors and the solids are rapidly cooled after only a few seconds retention in the desolventizing zone. Soybean protein flakes of high quality were produced with this minimum heat treatment in a pilot-plant operation. Data on the effect of vapor velocity and temperature are included and recommended operating conditions are given.

TOCOPHEROL OXIDATION IN NATURAL FATS.

E. N. Frankel, C. D. Evans, and Patricia M. Cooney.

J. Agr. Food Chem. 7(6): 438-441. June 1959.

Tocopherol oxidation follows the kinetics of a chain reaction. The presence of metallic contaminants increases appreciably the destruction of tocopherol. In highly unsaturated vegetable oils the initial rate of loss is small, but in cottonseed oil and lard containing added tocopherol it is appreciable.

INDUSTRIAL UTILIZATION OF WHEAT AND FLOUR.

F. R. Senti.

Northwest. Miller (Milling Production Section) 261(23, Sec. 2): 1a-9a. June 9, 1959.
Also in Amer. Miller and Processor 87(6): 16-18. June 1959 and 87(7): Portfolio
pp. A-C. July 1959; and in Bull. --Assoc. Operative Millers. 2460-2464. September 1959.

The present industrial uses of wheat are pointed out, and the problem of increasing industrial outlets for wheat is considered. Research on this problem now underway at the Northern Utilization Research and Development Division is outlined, and future research needed for the development of further industrial outlets is indicated.

ANTIBIOTICS AGAINST PLANT DISEASE, VI. AN AGAR-DIFFUSION METHOD FOR DETERMINING THE EFFECTS OF CHEMICALS ON GERMINATION OF BEAN-RUST UREDOSPORES.

Thomas G. Pridham, Eugene S. Sharpe, and Carolyn E. Kemp.

Antibiotics Ann. pp. 914-919, 1958-1959.

A novel method is described for determining the effects of chemicals on germination of bean rust (*Uromyces phaseoli typica* Arthur) uredospores. The principal difficulty encountered has been the inconsistent germination responses of the uredospores. The season and manner of collection and storage of spores or the self-inhibitory factors produced by the spores may be possible causes.

*CHARACTERISTICS OF CEREAL STARCHES.

Majel M. MacMasters and Ivan A. Wolff.

In "The Chemistry and Technology of Cereals as Food and Feed,"
edited by Samuel A. Matz, The AVI Publishing Co., Inc.,
Westport, Conn. Chapter 21, pp. 569-594. 1959.

The final chapters in this comprehensive survey by specialists in the field cover the chemical, physical, and physiological properties of the various components of cereals and cereal products. Starch is a major component in cereal grains. A separate chapter is therefore devoted to its properties, such as size and shape of granules, gelatinization, paste and gel characteristics, and chemical derivatives. Attention is also given to uses for which starch and its derivatives are fitted because of their characteristics.

CONTRACT RESEARCH PUBLICATIONS

(Report of research work done by an outside agency under contract with the U. S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division of the Agricultural Research Service.)

DIMETHYL DITHIOLFUMARATE AND SOME COPOLYMERIZATION REACTIONS.

C. S. Marvel and J. F. Porter. University of Illinois, Urbana.
J. Org. Chem. 24: 137-138. January 1959.

VINYL PINONATE-VINYL CHLORIDE COPOLYMERS.

C. S. Marvel and Eugene D. Vessel. University of Illinois, Urbana and
F. C. Magne, SU.
J. Polymer Sci. 36(130): 35-39. April 1959.

POLYMERIZATION REACTIONS OF ITACONIC ACID AND SOME OF ITS DERIVATIVES.

C. S. Marvel and Thomas H. Shepherd. University of Illinois, Urbana.

J. Org. Chem. 24: 599-605. May 1959.

CHAIN TRANSFER CONSTANTS OF VINYL ESTERS WITH TOLUENE.

C. F. Thompson, W. S. Port, and L. P. Witnauer. University of Illinois, Urbana.

J. Am. Chem. Soc. 81: 2552-2555. May 1959.

PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased from the U. S. Patent Office, Washington, D. C.]

ALKYL ESTERS OF ALKOXY-ACYLOXY STEARIC ACID.

Lyle E. Gast, John C. Cowan, Howard M. Teeter.

U. S. Patent 2,873,255. February 10, 1959.

Alkyl esters of alkoxy-acyloxy stearic acid have been found to possess many desirable properties as extreme low temperature lubricants; having pour points generally below -50° F. They are made by esterifying known derivatives of 9,10-dihydroxystearic acid.

PREPARATION OF STARCH-BISULPHITE ADDITION PRODUCTS.

Charles L. Mehlretter, John W. Van Cleve, Paul R. Watson.

U. S. Patent 2,880,236. March 31, 1959.

Dialdehyde starch is reacted with sodium bisulphite, sodium meta-bisulphite or sulphurous acid to produce bisulfite addition products which are useful as sizing and thickening agents, as adhesives, etc.

PREPARATION OF PARTIAL GLYCERIDES.

Robert E. Beal.

U. S. Patent 2,885,414. May 5, 1959.

Phosphatides, which occur in many kinds of crude vegetable oils, may be hydrolyzed with aqueous solutions of acid or bases to give free fatty acids, glycerol, phosphoric acid, various amines and minor amounts of other materials. No method of hydrolysis has been known which is selective for hydrolyzing the phosphoric acid from the glycerol while leaving the fatty acids still attached to the glycerol through their ester linkages. It has now been discovered that treatment of phosphatides or of oils containing phosphatides, with water in the presence of both anion and cation exchange resins at temperatures from 100° to 150° C. in the absence of any emulsifier, causes hydrolysis to proceed selectively at the phosphoric acid-glycerol bonds. Diglycerides and a lesser amount of monoglycerides are produced by the reaction.

PROCESS OF RETAINING SOFTNESS IN BAKERY PRODUCTS.

Chester W. Ofelt and John E. Hodge.

U. S. Patent 2,889,227. June 2, 1959.

In the production of yeast-raised bakery products, particularly bread, a minor amount of a compound selected from the group consisting of ascorbyl palmitate and hydrogenated ascorbyl palmitate is added to the dough prior to baking. The additive inhibits firming of the bread crumb on storage.

COATING COMPOSITIONS.

Howard M. Teeter, Wilma J. Schneider, and Lyle E. Gast.

U. S. Patent 2,889,309. June 2, 1959.

Substantial improvement in the alkali resistance of films prepared from copolymers comprising unsaturated fatty vinyl ethers is obtained by using a lead napthenate dryer and incorporating in the film from 0.5 to 3% of an antioxidant such as hydroquinone, β -naphthyl amine or phenyl β -naphthylamine.

S-(1,2-DICHLOROVINYL)-CYSTEINE AND METHOD FOR ITS PREPARATION.

Leonard L. McKinney, Francis B. Weakley, and Arthur C. Eldridge.

U. S. Patent 2,890,246. June 9, 1959.

The disodium salt of cysteine was prepared by adding cystine or cysteine to liquid ammonia containing the required amount of sodium. Trichloroethylene was then added to the liquid ammonia solution to produce the sodium salt of the cysteine derivative. After removing the ammonia, the residue was dissolved in water and the pH adjusted to 5 to precipitate the S-(1,2-dichlorovinyl)-cysteine. This compound exhibits powerful insecticidal and fungicidal activity.

METHOD FOR THE PRODUCTION OF CAROTENES.

Ralph F. Anderson.

U. S. Patent 2,890,989. June 16, 1959.

This invention relates to the fermentative production of beta-carotene and related carotenoids. The process consists of aerobically incubating appropriate carotene-producing microorganisms in a medium composed of a naturally occurring nitrogen and carbohydrate source, thiamin, and the usual mineral nutrients. In addition, a lipid material such as a naturally occurring fat or oil, a surface active agent (detergent or wetting agent), and beta-ionone are incorporated into the medium. Optimum yields are obtained after 2 to 7 days incubation, depending upon the conditions of fermentation employed.

Similar lists of publication abstracts and patents are available from the other three Regional Utilization Research and Development Divisions of the Agricultural Research Service, U. S. Department of Agriculture. The addresses and fields of research covered are:

<u>Division</u>	<u>Principal Fields of Research</u>
Eastern Utilization Research and Development Division 600 East Mermaid Lane Philadelphia 18, Pennsylvania	Eastern deciduous fruits; Eastern vegetables; meat; dairy products; animal fats; hides, tanning materials, and leather; honey; maple products; tobacco; allergens of agricultural products; and new crops.
Southern Utilization Research and Development Division Post Office Box 19687 New Orleans 19, Louisiana	Cotton, cottonseed; tung fruit; peanuts; rice; sugarcane; pine gum; citrus and other fruits; sweetpotatoes, cucumbers, and other vegetables.
Western Utilization Research and Development Division 800 Buchanan Street Albany 10, California	Western fruits, tree nuts, and vegetables; poultry products; alfalfa and other forage crops; wheat, rice, and barley; wool and mohair; sugar beets; dry beans and peas; castor and dimorpho- theca; and selected new crops.